In order to remove 0 from the iron again, there must per kilogramme of the latter be employed equal amounts of energy. It follows from this that all those materials appear suitable to serve as reducing agents for iron oxide which, by their combination with oxygen, evolve a greater amount of energy than the iron itself. Now 1 kilogramme of oxygen yields

with Al to form A1203 . • 8,162 calories. „ Si „ Si02 . . 6,850 „ Mn „ MnO . . 6,247

and thus it appears as if all the materials named are capable of achieving the removal of the oxygen from iron oxides, and therefore as if they were employable for the winning of metallic iron.

It is not sufficient simply to bring these materials in contact with iron oxide in order to produce metallic iron. Each and every one of the minutest pieces of ore consists of a great ,

quantity of molecules, from each of which its oxygen must be split off. Each individual molecule must thus be brought into direct contact with the reducing agent. That does not generally occur so long as the materials are present in the solid ;

form. Only if they go over into the fluid or gaseous form of aggregation, by which the molecules are freely mobile and can actually reach each other, are the conditions for the mutual inter-reaction given.

One can, therefore, mix finely divided iron ore with equally finely powdered aluminium, without the occurrence of any change whatever in the two materials, but if one produces in any desired point of this mixture an increase of temperature f

which brings a little of the substance to the melting point, the reaction takes place forthwith. The amounts of heat set free bring further portions of the mixture to the melting point and thereby the reaction and the decomposition of the entire mass results, and by employment of different reducing agents with greater velocity, the greater the amount of heat set free.

The materials referred to,'however, likewise occur in nature only as compounds of oxygen, and their recovery in the pure condition is obviously brought about with greater difficulty than that of iron.